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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

BULLOCK JR, LEWIS ALEXANDER

ART UNIT	PAPER NUMBER
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2195

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/823,482

Applicant(s)

COTA-ROBLES ET AL.

Examiner

Lewis A. Bullock, Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-8,10,11,13-26,28-31,33-40,42 and 44 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-8,10,11,13-26,28-31,33-40,42 and 44 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 9/15/06
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3-8, 10, 11, 13-26, 28-31; 33-40, 42 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over BUGNION in view of Applicants' Admitted Prior Art (APA) and "EPICS: PORTING iocCORE TO MULTIPLE OPERATING SYSTEMS" by KRAIMER et al.

3. As per claims 1, 8, 11, 26, 31, 40, 42, and 44, Bugnion teaches the invention as claimed, including a hardware platform including a hardware component of a soft device (col. 7 lines 12-25); constructing a soft device, comprising implementing a driver of the soft device in a virtual machine monitor (col. 4 lines 52-61; col. 12, lines 26-35); and making the soft device available for use by one or more virtual machines coupled to the virtual machine monitor (col. 7 lines 12-25). In addition, Bugnion teaches the VMM directly access the system hardware, this includes such known structures, i.e. processors, registers, associated memory devices, any memory management unit, I/O devices, and co-processors, and so on. Hence Bugnion does not limit the type of device controlled by the VMM. It is also well known in the art that a virtual machine monitor is a resource to other virtual machine monitors that invoke their operations (See the cited publications as examples) and a virtual machine in and of itself as a software

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construct that controls system resources. However, Bugnion does not teach the driver controlling a residual fixed function hardware device represented by a hardware component of the device.

APA teaches a soft device wherein a software component of the soft device, i.e. a software driver controls a residual fixed function hardware device represented by a hardware component of the soft device (pg. 1, line 12 – page 2, line 5). Therefore, it would be obvious to one of ordinary skill in the art that the driver loaded in Bugnion is the driver of a well known soft device and therefore, allows the VMM to control the hardware component of the soft device in order to control a soft device. However, neither Bugnion nor APA teach the soft device implemented independent of the host operating system.

Kraimer teaches a VME/VXI based system that interface to various hardware interfaces, wherein the soft device is implemented independent of the host operating system and can work with any operating system available (pages 1 and 4). It would be obvious to one of ordinary skill in the art that the soft device that is implemented in a platform independent language when emulated onto a virtual machine allows running many different types of applications on the computer system regardless of what the host operating system is (col. 8, lines 10-15). Therefore, it would be obvious to one of ordinary skill in the art to combine the teachings of Bugnion with the teachings of APA and Kraimer in order to facilitate the porting of control software to other operating systems (introduction).

As per claims 3, 10, 13, 16, 19, 28, 33-34, and 36, Bugnion teaches the invention as claimed, including exporting an emulation of a fixed function hardware device to said any of the one or more virtual machines (col. 7 lines 12-25);

by presenting the first virtual machine to the second virtual machine as an external, internal, or hardware device (col. 8 lines 5-19); and

emulating communication between the first virtual machine and the second virtual machine (col. 15 line 58 - col. 16 line 3).

As per claim 4, Bugnion teaches the invention as claimed, including performing computations requested by said any of the one or more virtual machines without notifying a residual fixed function device (col. 8 lines 33-52).

As per claim 5, Bugnion teaches the invention as claimed, including transferring an operation requested by said any of the one or more virtual machines to a residual fixed function device (col. 8 lines 33-46); and the residual fixed function device performing the operation requested by said any of the one or more virtual machines (col. 8 lines 5-19).

As per claim 6, Bugnion teaches the invention as claimed, including performing a portion of computations requested by said any of the one or more virtual machines to a residual fixed function device (col. 8 lines 5-19; col. 8 lines 33-52); and performing a set of operations on hardware registers of a residual fixed function device to complete a task requested by said any of the one or more virtual machines (col. 9 lines 41-51).

As per claim 7, Bugnion teaches the invention as claimed, including manipulating data stored in memory to effect zero or more transformations (col. 7 lines 32-45); and transferring data to or from a residual hardware device using a direct memory access (DMA) technique (col. 7 lines 32-45; col. 12 lines 6-19).

As per claim 23, Bugnion teaches the invention as claimed, including configuring the first virtual machine to match the hardware device (col. 7 lines 12-25).

As per claim 24, Bugnion teaches the invention as claimed, including the software component of the soft device comprises at least a portion of software of a fixed function device (col. 8 line 66 - col. 9 line 19).

As per claim 25, Bugnion teaches the invention as claimed, including varying the portion of software that is used as the software component depending on how closely the first virtual machine matches the hardware device (col. 8 line 66 - col. 9 line 19).

Claim Rejections - 35 USC § 103

4. Claims 14-15, 17-18, 20-22, 29-30, 35 and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over BUGNION in view of APA and KRAIMER as applied to claim 13 above, and further in view of LIM (U.S. Patent 6,795,966).

As per claim 14-15, 17-18 20-22, 29-30, 35, and 37-39, Lim teaches the invention as claimed, including emulating communication by providing a virtualized device (col. 7 lines 38-45; col. 14 lines 28-33) that provides a communication link between the first and second virtual machines by linking the virtualized device to the soft device and trapping and reflecting access to the virtualized devices (col. 7 lines 45-54; col. 14 lines 33-43), wherein the virtualized device is any one of a PCI card, an external USB device, an internal USB device, a network interface card, and any other standard personal computer device (col. 16 lines 16-34).

It would have been obvious to one of ordinary skill in the art to combine Bugnion, APA, KRAIMER and Lim as the method disclosed by Bugnion provides all the necessary tools to virtualize an entire computer system, but does not specifically mention how communication is handled between virtual machines that are acting as peripheral devices. There is a great deal of overlap in the disclosures of Bugnion and Lim, but Lim is cited to show that a virtual machine can be used to emulate any type of peripheral device and appear to the host operating system as though it were the original device. All communications that are normally routed through the peripheral device go through the virtual machine, and the virtual machine transparently communicates with

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the physical resources. As any component can be virtualized, the typical manner in which a device operates is inherently implemented within the virtual machine.

Response to Arguments

5. Applicant's arguments with respect to claims 1, 3-8, 10, 11, 13-26, 28-31, 33-40, 42 and 44 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lewis A. Bullock, Jr. whose telephone number is (571)


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272-3759. The examiner can normally be reached on Monday-Friday, 8:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

November 27, 2006


LEWIS A. BULLOCK, JR.
PRIMARY EXAMINER